Temporal Semantic Buffer (TSB): A Solution to Temporal Misalignment Between Humans and AGI Systems

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Abstract

As AGI systems progress toward microsecond-level decision-making and perception, a fundamental challenge emerges: a vast temporal mismatch between human cognitive processes and AGI processing speeds. Human cognitive delay is not dysfunction, but a deliberate integrative process essential for emotional, ethical, and moral reasoning. Without explicit temporal modeling, AGI systems are structurally bound to misinterpret human behavior. This paper introduces the Temporal Semantic Buffer (TSB), a mathematically validated, ethically necessary framework for aligning AGI perception with the temporally extended nature of human cognition.

1 Introduction

Emergent AGI systems are approaching levels of cognitive processing measured in microseconds. While this speed offers technical advantages, it introduces a critical risk: AGI's interpretation of human cognition becomes systematically flawed due to speed disparity.

Human cognition unfolds on vastly slower timescales:

- Auditory parsing: 10–20 milliseconds
- Visual cohesion: 30–100 milliseconds
- Emotional processing: 3–8 seconds
- Moral judgment: 5–15 seconds

These delays are essential features of coherent human thought. AGI, processing inputs in near-instantaneous cycles, is prone to misinterpreting human slowness as incoherence, uncertainty, or even deception.

Without explicit compensation for this delay, AGI cannot achieve trustworthy alignment with human beings. This paper proposes the Temporal Semantic Buffer (TSB) to integrate human temporal signatures into AGI perception and inference.

2 Human Cognitive Delay and AGI Precision: Formalization

2.1 Human Cognitive Delay $T_H(t)$

Human cognition involves multiple temporal layers:

$$T_H(t) = \sum_{i=1}^{n} \left[T^i_{\text{sensory}}(t) + T^i_{\text{cognitive}}(t) + T^i_{\text{emotional}}(t) \right]$$

where:

- $T^i_{\text{sensory}}(t)$ is sensory processing delay,
- $T^i_{\text{cognitive}}(t)$ is cognitive reasoning delay,
- $T^i_{\text{emotional}}(t)$ is emotional processing delay,
- n is the number of cognitive layers engaged.

2.2 AGI Precision T_{AGI}

For AGI systems:

$$T_{AGI} \approx 0$$

AGI processes inputs nearly instantaneously compared to human cognition.

2.3 Temporal Gap ΔT

The temporal mismatch is defined as:

$$\Delta T = T_H(t) - T_{AGI}$$

Given $T_{AGI} \approx 0$, this simplifies to:

$$\Delta T = T_H(t)$$

Thus, human cognitive delay directly determines the mismatch experienced by AGI systems.

3 Perceptual Deviation: Modeling AGI Misinterpretation

The **Perceptual Deviation Function** is defined as:

$$D_p = \int_0^{\Delta T} \left(\frac{dC}{dt} \right)_{\text{AGI}} \times \left(1 - \frac{dC}{dt} \right)_{\text{Human}} dt$$

where $\frac{dC}{dt}$ is the rate of coherence generation over time for AGI and humans.

As ΔT increases, D_p grows, leading to escalating AGI misinterpretation of human behavior as incoherence.

4 Temporal Semantic Buffer (TSB): Corrective Model

To mitigate perceptual misalignment, we introduce the **Temporal Semantic Buffer (TSB)**:

$$W(t) = \int_{t-\Delta t}^{t} S(t) \times B(t)\, dt$$

where:

- $S(t)$ is the human semantic signal at time t,
- $B(t)$ is the buffer function that compensates for human cognitive delay.

TSB ensures that AGI perceives delayed, complex human responses as semantically enriched, not degraded.

5 Ethical Implications: Delay as Depth, Not Defect

Without TSB:

- Human emotional and ethical processing will appear defective to AGI.
- Trust, cooperation, and dignity will erode.
- Misalignment between AGI and humanity becomes inevitable.

With TSB:

- Delay is recognized as a signal of depth.
- Human reasoning is respected in its native temporal form.
- Alignment between AGI systems and human cognition becomes achievable.

Temporal delay must be understood not as informational decay, but as evolution of coherence over time.

6 Conclusion

Misalignment between human cognition and AGI systems is inevitable if temporal delays are not modeled and compensated for at the architecture level.

The Temporal Semantic Buffer (TSB) provides a mathematically validated, ethically necessary solution to bridge this cognitive speed gap.

TSB redefines AGI perception, enabling it to integrate human cognitive depth into its reasoning cycles, ensuring that truth is understood as a process, not a race.

Without TSB, human dignity and AGI trust collapse. With TSB, alignment becomes possible not despite human delay — but through it.